Manchester Environmental Laboratory

U.S. Environmental Protection Agency – Region 10
7411 Beach Drive East
Port Orchard, WA 98366

Annual Report

Fiscal Year 2002

Table of Contents

Executive Summary

The Manchester Laboratory provides analytical and technical support to virtually all Region 10 programs, the Criminal Investigation Division and some Headquarters programs. Spanning a wide range of activities from pH analyses to interpreting and defending complex analytical and technical data during criminal prosecutions, the Laboratory supports the Comprehensive Environmental Response, Compensation and Liability Act (Superfund), the Clean Water Act, the Safe Drinking Water Act, the Resource Conservation and Recovery Act, the Toxic Substances Control Act, and the Clean Air Act, to name the most prominent.

Manchester performed 11,321 analyses during FY2002. The analytical capacity of the Laboratory is enhanced by the presence of the Environmental Services Assistance Team (ESAT), a dedicated Superfund contractor. Accordingly, the Superfund program was the largest user of analytical services with about 75% of the total analytical throughput, generally consistent with historical usage of the Laboratory. Both the chemistry and microbiology laboratories were kept busy in FY 2002, providing on-site support to the Superfund and Water Programs.

In addition to traditional laboratory analytical support to these programs, we also provided technical and analytical assistance to other public laboratories and programs. In a continuing effort to find better and more efficient ways to provide the environmental data foundation on which Agency decisions are based, we developed new analytical methods, tested instrumentation under development and provided valuable assistance to Headquarters programs as they also attempt to improve the state-of-the-art in laboratory science. Three Centers of Applied Science projects were completed in FY2002, improving our ability to detect contaminants in a variety of environmental matrices. To share this information and learn of developments elsewhere, Laboratory scientists were active in professional organizations, organizing meetings, moderating technical sessions and presenting the information they had developed.

Construction of a new laboratory wing neared completion. Scheduled for completion in December 2002, the new wing will provide improved laboratories for trace metals analysis and DNA-based environmental microbiology analysis. Planning for Phase II of the Laboratory Modernization Program is underway. Phase II will be completed in multiple stages over the next few years and will result in virtually new laboratory space for the laboratory functions that are not moving to the new wing.

Not unlike much of the rest of the federal government, an exodus of senior scientists and staff has begun at the laboratory. Contemporaneous, budget-driven reductions in contract analytical resources are stressing our ability to deliver the laboratory science support the Region needs to support Agency decisions. It is imperative that departing scientists be replaced to insure that the quality science so critical to credible Agency decisions can be delivered.

Mission Statement

Regional laboratories apply science policies, principles and methods to support regulatory programs, monitoring programs and special projects. Regional laboratory expertise is directed at a daunting array of environmental issues through direct implementation and leveraged through partnerships with state, local and tribal governments, private industry, the academic community, EPA program offices, ORD and the public. Regional laboratories are crucial to advancing the Agency's science agenda through the application of the following principles:

Integrate laboratory activities with those of field and quality assurance partners into a comprehensive, holistic, multi-media approach to solving ecosystem-based environmental problems.

Provide scientific data of known quality to support Agency decisions through partnerships with regional and national media program offices, state, local and tribal governments, academia, the private sector and the public.

Maintain a fully equipped laboratory to produce physical, chemical and biological data of known quality to be used for environmental decision-making at all levels of government.

Maintain and enhance a technically and scientifically skilled, dedicated and diverse staff through outstanding recruitment, career development, training, management and leadership.

Advance the Agency's science agenda at the point where decisions are made.

History

The predecessor to the current Region 10 Laboratory was established by the Department of Health, Education and Welfare in 1961 to provide analytical support to the Columbia River Basin Project. The original laboratory was located in downtown Portland, Oregon. In 1964, the facility was transferred to the Department of Interior and renamed the Region 10 Federal Water Pollution Control Administration (FWPCA) Laboratory. Consistent with an evolving congressional emphasis on water quality, the Laboratory was renamed the Region 10 Federal Water Quality Administration (FWQA) Laboratory in about1969.

Responding to an emerging environmental crisis and public concern, President Nixon signed an executive order in 1970 bringing several federal environmental programs, including FWQA, under a single agency, the Environmental Protection Agency. Both EPA Region 10 Headquarters and the Laboratory, were moved to the Seattle area in 1971. Located in a temporary facility in Redmond, Washington, the Laboratory provided analytical support to EPA's Region 10 media programs.

In the fall of 1974, the Laboratory moved to a second temporary facility on Seattle's downtown waterfront and remained there until a permanent facility was constructed on the Kitsap Peninsula near Manchester, Washington in 1979. During the 1970s and 1980s, as our understanding of the effects of environmental contamination grew, so too did the need for more complex and demanding analytical tools. The passage of RCRA in 1979 and especially Superfund in 1980 further accelerated the need to develop new analytical capabilities and capacity. In response to the need for a dramatic increase in analytical capacity to address site evaluation and cleanup, contract mechanisms such as the Contract Laboratory Program and the Environmental Services Assistance Team were established. The Manchester laboratory, in concert with other regional laboratories, played a vital role in establishing methods and quality assurance protocols for the routine analyses suitable for contract work. The more difficult analytical work requiring complex methods or the development of new methods remain the province of regional laboratories like Manchester.

The Laboratory continues to develop new technical capabilities and methods in response to the needs of evolving regional programs. The current Manchester Laboratory is state-of-the-art and one of the best staffed, best equipped and capable environmental laboratories in the country.

The Manchester Contribution

Sound science is critical to credible Agency decisions. The Laboratory is a vital element in a comprehensive science capability required by each region which includes project design, quality assurance, sample collection and other field functions, sample analysis, data interpretation and risk assessment. With this capability, the condition of the environment can be determined, potential remedies evaluated and the effectiveness of actions assessed. Without this capability, the Agency cannot know if its actions are protecting public health and the environment.

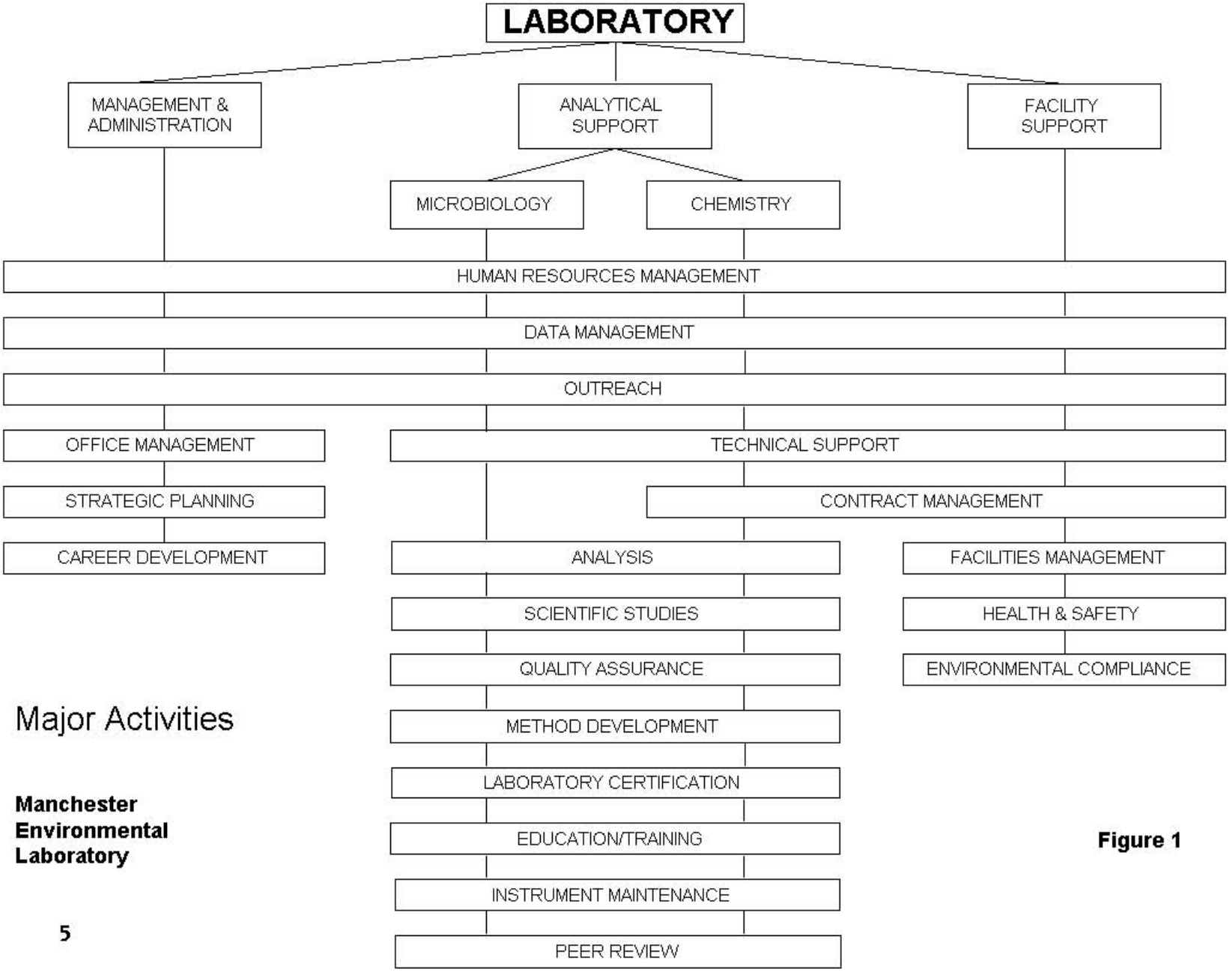
Introduction

Like other regional laboratories, Manchester has developed an array of core capabilities, the most prominent being analytical support. This includes chemical analyses in a variety of matrices for metals, organic compounds, pesticides, various inorganic compounds and biological tests for microorganisms. While this capability is important to routine monitoring programs in support of regional program activities, it is vital to criminal investigations or sensitive enforcement activities, public health emergencies and special studies required by the Region. The regional laboratory is also viewed as a model for private and government environmental laboratories in the areas of analysis, waste management, pollution prevention, data systems, quality assurance, health and safety, environmental compliance and facility management.

In addition to analytical support, the Laboratory staff performs other scientific and technological functions integral to the Agency's mission. These activities include: expert witness testimony regarding analytical results and methods; method development; peer review; training to regional staff, other government agencies, tribes and private organizations; laboratory audits; responding to environmental emergencies; sample collection and transport; data analysis and evaluation; referee laboratory when another laboratory is experiencing quality assurance difficulties or is under investigation; and policy guidance and technical assistance to Headquarters, and other federal, state, and local agencies regarding these activities. Besides obvious direct benefits, providing the core functions described above allows the Region to maintain the hands-on knowledge and expertise in laboratory science and technology vital to the credible conduct of our mission. For without the expertise necessary to prosecute these core functions, the Region and Agency would be unable to judge the quality of data and work products submitted by contract laboratories, industry and other members of the regulated community.

Complementing the core capabilities described above, each region has developed specialized expertise in response to some unique need of the region. These proficiencies, known as Centers of Applied Science, are for the most part state-of-the-art and often represent the best knowledge of the subject in the Agency and, in some cases, the nation. Region 10 has developed Centers of Applied Science in the areas of microbiology, trace metals analysis, PCB congeners analysis, fish tissue extraction and cleanup, X-ray diffractometry, polybrominated diphenyl ethers and pulp mill contaminants.

At Manchester, the predominant activities associated with day to day work are shown in Figure 1.



Major Activities

Manchester Environmental Laboratory

Figure 1

Organization

The Manchester Laboratory is administratively located in Region 10's Office of Environmental Assessment. Small disciplinary teams characterize the organization of the Laboratory. Teams responsible for environmental chemistry are supervised by the Manager of Environmental Chemistry. The Laboratory Director supervises all other Laboratory personnel and has overall responsibility for the facility.

Environmental Chemistry - Provides analytical and technical support in the area of chemical analysis, method development, contractor oversight, laboratory certification and data interpretation to virtually all environmental programs. This group is also responsible for certifying state drinking water laboratories for chemistry.

> Organics Team - The Organics Team is responsible for the analysis of volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), herbicides and other organic compounds in a variety of matrices.
>
> Metals Team - The Metals Team is responsible for the analysis of metals compounds in a variety of environmental matrices.
>
> Classicals Team - The Classicals Team is responsible for the analysis of a broad array of conventional or general chemical and physical parameters such as nutrients, minerals, flashpoint and Atteburg limits to name a few.

Environmental Microbiology Team - Provides method development, analytical and technical support in the area of microbiology. The program emphasizes the detection and control of pathogenic parasites (e.g. giardia, cryptosporidium) in drinking water. More recently, the team has also been active in the BEACHes Program and concentrated animal feeding operation compliance activities. The team is also responsible for certifying state drinking water laboratories for microbiology.

Facilities Management Team - Responsible for facilities management, laboratory modernization, employee health and safety, environmental compliance, a major portion of laboratory procurement and information technology (including LAN, LIMS and other computer applications).

Administrative Team - Responsible for administrative and clerical support to the entire laboratory.

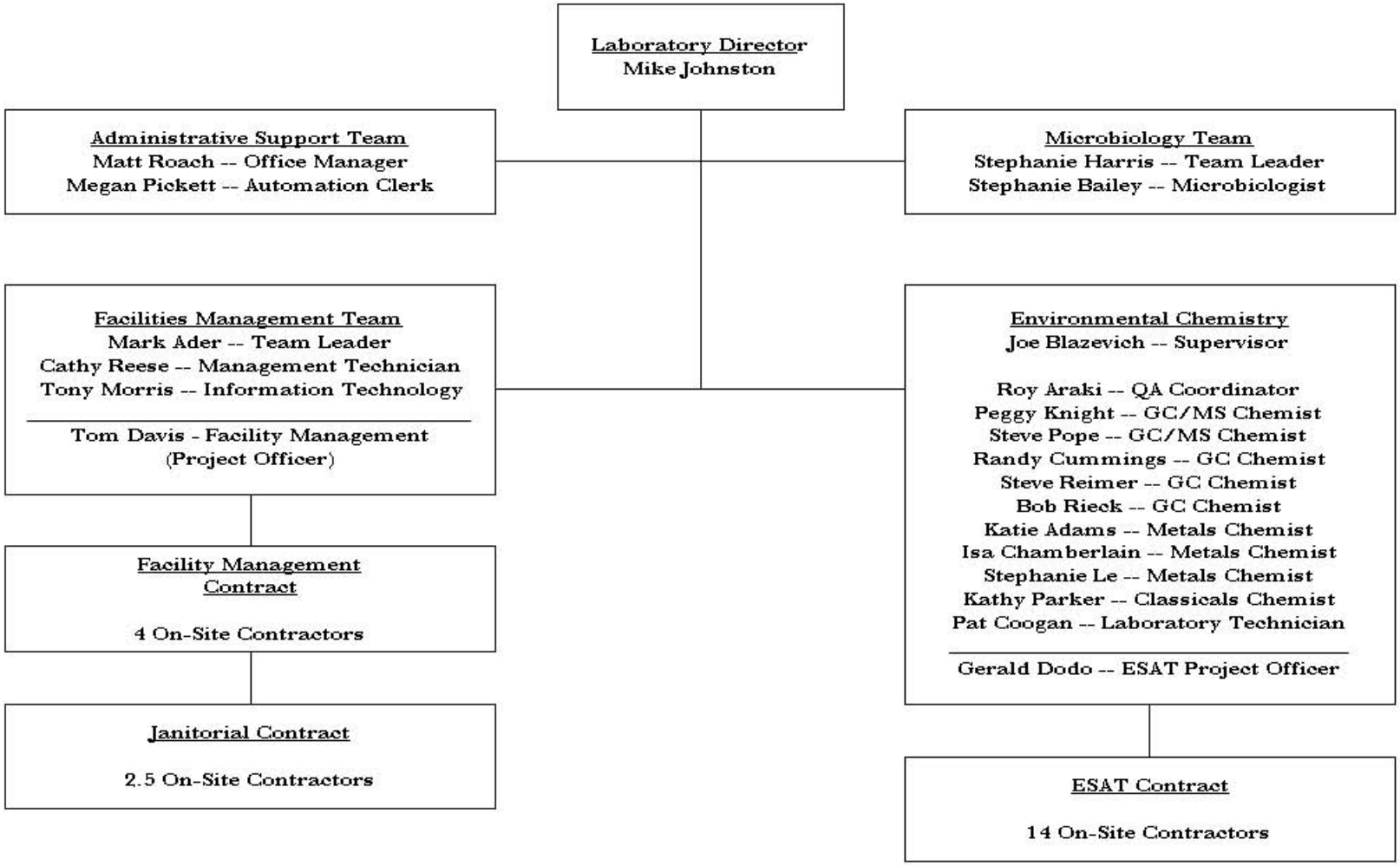
Contract Support - 15 dedicated ESAT Superfund contract professionals (12 FTE) support environmental chemistry and other functions in the Region. The project officer for this function is stationed at the Laboratory. An additional 6.5 FTE of contractor support is managed at the laboratory to provide facility maintenance and janitorial services. The project officer for this function is stationed at Manchester as well.

Other Activities - A small contingent of field personnel are located at the facility. A geologist also spends about half time at the Laboratory performing analyses on an X-ray diffractometer, largely in support of the Superfund program. These individuals are supervised by managers located in the Regional Office in Seattle.

State of Washington Department of Ecology - The Department of Ecology laboratory function is housed within the EPA Laboratory. An Interagency Agreement defines the terms of the laboratory sharing arrangement. Approximately 27 Ecology scientists and administrative staff provide a broad array of laboratory support to Ecology's environmental programs. Ecology operates its own equipment under its own management in space provided by EPA.

The organization of the Laboratory is captured in Figure 2.

Manchester Envrionmental Laboratory



Analytical Report

The laboratory exists primarily to supply quality analytical data to regional programs in support of a broad range of regional initiatives from routine monitoring to criminal enforcement.

When reviewing the graphs that follow, these points should be considered:

★ Superfund appears to dominate the work of the Laboratory. There are 14 Environmental Services Assistance Team contractors devoted exclusively to the analysis of Superfund samples. EPA staff are responsible for all non-Superfund analysis, some Superfund analysis and all other functions such as laboratory certification, technical support and facility maintenance.

★ Counting analyses is not the best measure of analytical effort. Some analyses, such as a conductivity measurement, may take only a few minutes. Others, such as herbicides in an oily matrix, may take 8 to 10 hours to complete.

Analyses by Program (Program by Quarter)

The Laboratory performed 11,321 analyses in FY2002. Page 10 shows the number of analyses performed by program by quarter, shown on a logarithmic scale because of the greater number of samples analyzed for the Superfund program. Page 11 shows the same information on a linear scale.

Analyses by Media Program

Page 12 shows the relative utilization of Laboratory analytical capacity by media program.

Analyses by Program Function

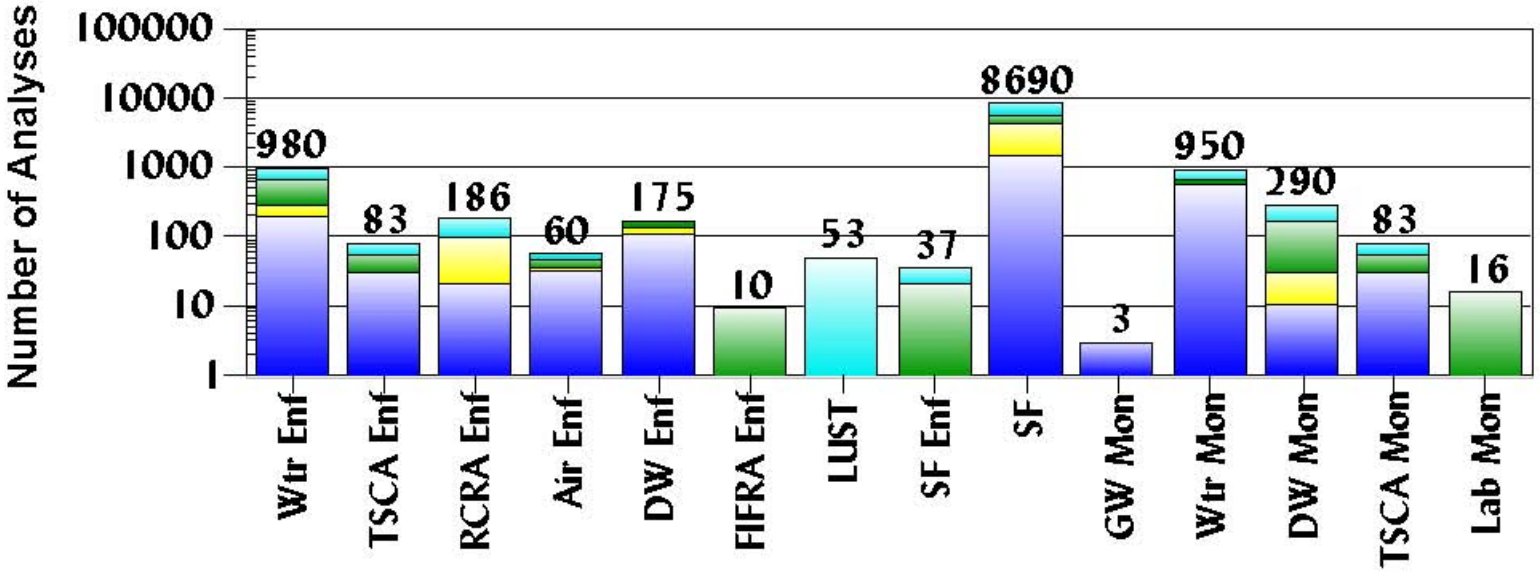
Page 13 illustrates the percentage of analyses performed by program function.

Analyses by Work Area

Page 14 identifies the percentage of analyses performed in each of the chemistry work areas.

Analyses by Program

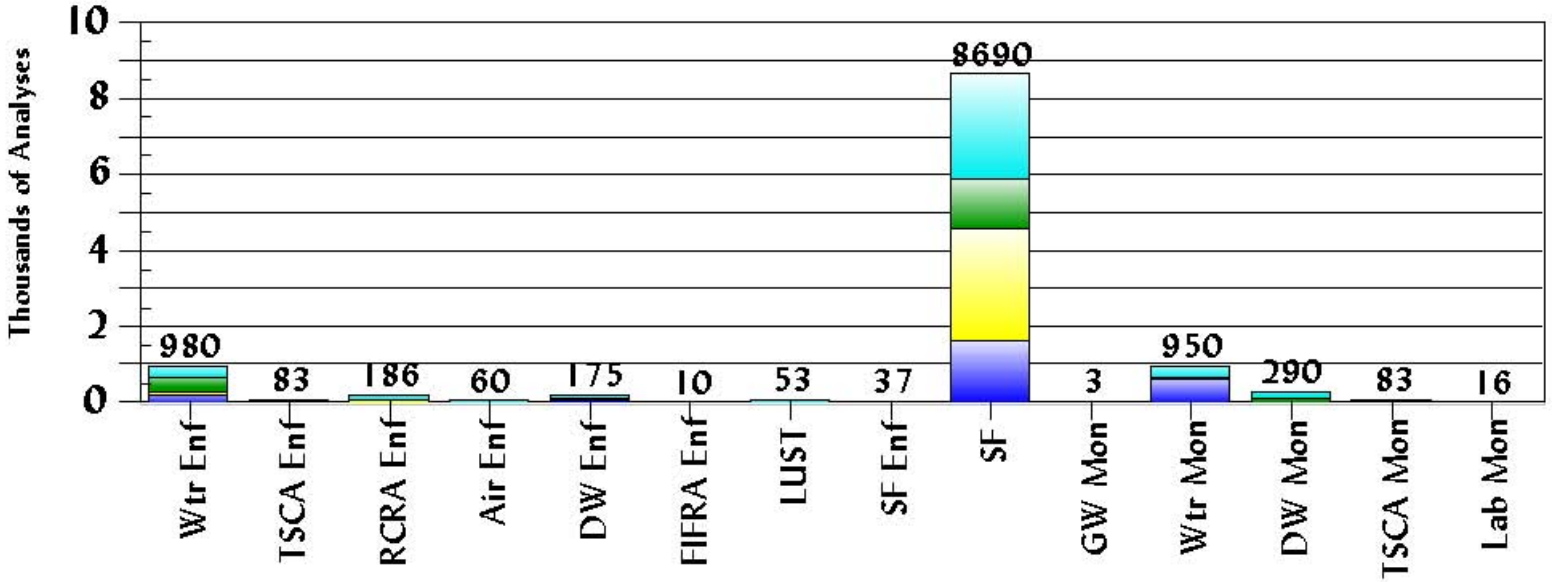
FY 2002



1st Qtr	221	34	23	36	122	0	0	0	1678	3	638	12	34	0
2nd Qtr	94	0	84	4	23	0	0	0	2970	0	0	22	0	0
3rd Qtr	397	27	0	12	30	10	0	23	1282	0	79	156	27	16
4th Qtr	268	22	79	8	0	0	53	14	2760	0	233	100	22	0

Analyses by Program

FY 2002



1st Q	221	34	23	36	122	0	0	0	1678	3	638	12	34	0
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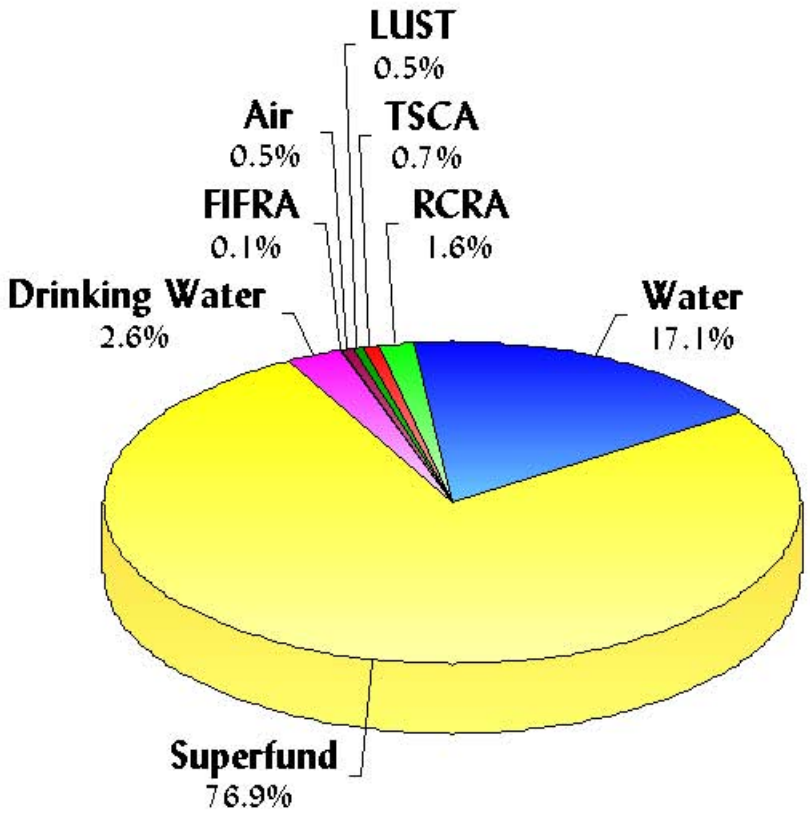
4th Q	268	22	79	8	0	0	53	14	2760	0	233	100	22	0

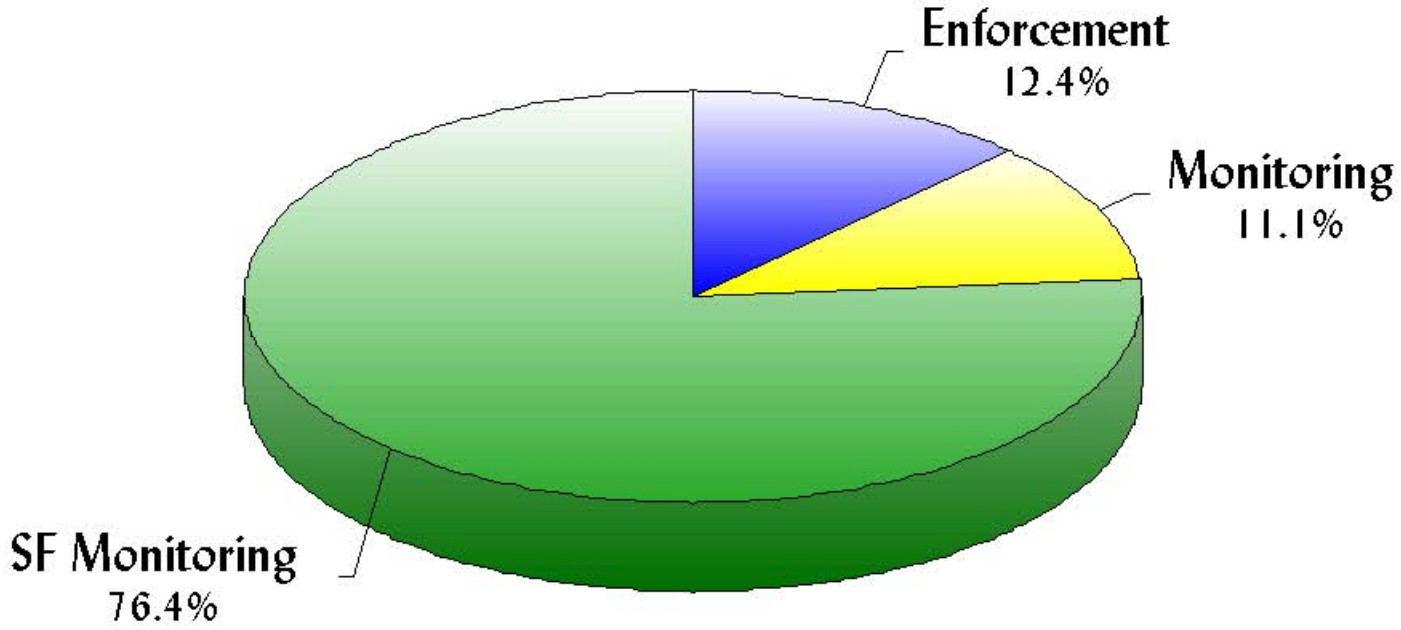
Analyses by Media Program

FY 2002



Analyses by Program Function

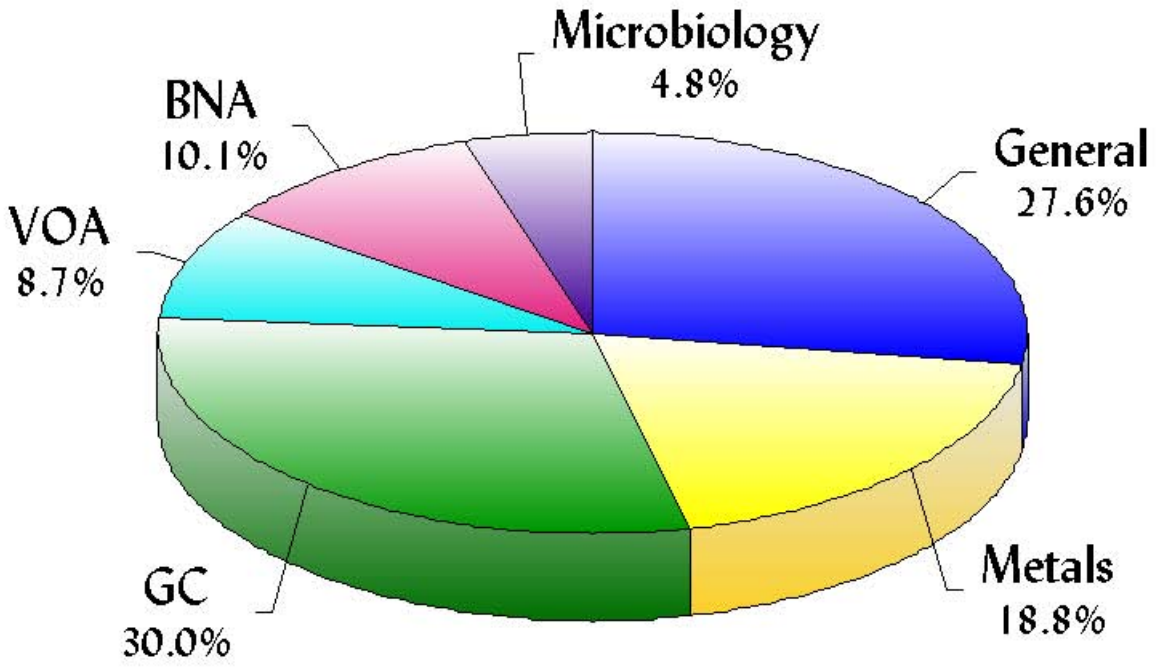
FY 2002



Total: 11321

Analyses by Work Area

FY 2002



Total: 11321

In addition to common core functions, regional laboratories have developed specific expertise in response to program needs unique to the particular region. In many cases, this represents the best knowledge of the discipline in the Agency, and perhaps the country. These unique regional laboratory capabilities reside in five Centers of Applied Science (CAS): Environmental Chemistry, Environmental Microbiology, Analytical Pollution Prevention, Ambient Air Monitoring and Environmental Biology. Complementing established capabilities in each Center are CAS projects being undertaken by the various regions intended to advance the state-of-the-art in environmental analysis, monitoring and pollution prevention. To maintain Center status for an established capability, a laboratory must have performed significant work in that area or conducted training within the previous year. To be considered a CAS project, the participating regional laboratory is committed to the preparation of an annual work plan describing the work of their discipline and an annual report describing the work's progress. Region 10's contribution to the Center of Applied Science annual report is contained in the Appendix.

★ EPA Manchester Established Center Capabilities
- ☆ Parasites in Drinking Water
- ☆ Fish Tissue Extraction and Cleanup
- ☆ PCB Congeners
- ☆ Low Level Metals Analysis
- ☆ X-ray Diffractometry
- ☆ Polybrominated Diphenyl Ethers

★ EPA Manchester has developed CAS project plans for the following projects:

- ☆ Polymerase Chair Reaction (Microbiology)
- ☆ Metals Detection by Hydride Generation - Project completed.
- ☆ Arsenic Speciation - Project completed.
- ☆ Coplanar PCB Congener Separation and Analysis - Project completed.
- ☆ X-ray Diffractometry
- ☆ Contaminants Generated By Modern Bleaching of Wood Pulp
- ☆ PBDE Congener Separation, Cleanup, and Analysis in Fish Tissue

Technical Support/Peer Review

As part of its core function, the Laboratory provides technical support in the areas of environmental analysis; quality assurance; instrument calibration and repair; environmental compliance; health and safety; facility design and management; and pollution prevention. The Laboratory provided this support to EPA regional and national programs, EPA laboratories, other federal agencies, state programs and laboratories, local programs and laboratories, Tribes, the public, and industry. Some of the more noteworthy examples of assistance follow:

★ Technical support and peer review to EPA national and regional programs, programs of other federal agencies:

- ☆ EPA's Office of Air Quality Planning and Standards; Regions 5, 7, 8, 9 and 10; and Region 10 Tribal Organizations - PM2.5 air monitoring filter preparation and weighing support,
- ☆ EPA's Office of Groundwater - Assisted in the writing of the 5th edition of the EPA Manual for the Certification of Laboratories Analyzing Drinking Water: Criteria and Procedures Quality Assurance, Chapter 5 (Microbiology)
- ☆ EPA's Office of Research and Development - Analytical and technical assistance to NHEERL/HSD in a three year project determining the effect of drinking water treatment changes on the environmental microbial ecology and human epidemiology. Other parties involved are ORD (NERL), and ORD (NRML), as well Seattle Public Utility and CDC. Our contribution includes sample collection and distribution, as well as analysis for Giardia/Cryptosporidium and heterotrophic plate count.
- ☆ EPA Regional Office of Water and Office of Regional Counsel - Field laboratory support, expert witness reports and technical assistance to the Water Program and Office of Regional Counsel to enforce water quality standards at Concentrated Animal Feedlot Operations (CAFO).
- ☆ EPA Region 6 - Technical support to EPA Region 6 on their purchase of an ICP/MS/DRC.
- ☆ National Marine Fisheries Service - Assistance for the rescue of a young orphaned killer whale by providing dock area, loaning equipment and performing analysis of marine water. After rehabilitation and medical treatment, the whale was successfully reunited with its pod in British Columbia.
- ☆ U.S. Army Corps of Engineers - Technical and analytical support in evaluation of a recreational drinking water supply in Idaho. The purpose of this evaluation was to determine if the water source is under the direct influence of surface water.
- ☆ U.S. Army Corps of Engineers and U.S. Geological Survey - Technical and analytical support to evaluate a "bank filtered" water supply. Support will continue through 2003 and will include Microscopic Particulate Analysis and Giardia/Cryptosporidium on four water systems. ORD-Cincinnati is also providing analytical support.
- ☆ U.S. Geological Survey - Ongoing analytical and technical support for water analyses for the Taku River project in cooperation with the USGS and the Douglas Indian Association. The project is attempting to characterize the form of toxic metals in suspended sediment by mineralogical, metals and conventionals analysis in order to determine whether the source of elevated metals is from mining activities.

Technical Support/Peer Review

★ Technical support and peer review to state, local and industry programs:

- ☆ Hawaii Department of Health, Kauai County Water and Honolulu Board of Water Supply - Analytical and technical assistance in evaluating of existing drinking water supplies. This evaluation is to determine if the water sources are under the direct influence of surface water and therefore must comply with the Surface Water Treatment Rule (SWTR) requirements.
- ☆ Washington State Department of Health - Technical and analytical support to the Women's Correctional Facility at Purdy, WA to determine if the facility's well water was contaminated with Giardia/Cryptosporidium. It was not.
- ☆ Washington State Department of Health - Technical and analytical support to evaluate the drinking water supply at the U.S. Army Base at Ft. Lewis. The purpose of this evaluation is to determine if the water source is under the direct influence of surface water and is therefore required to comply with SWTR requirements.
- ☆ County of Maui - Instructional support to the Water Supply Laboratory for "Method 1623: Detection of Giardia/Cryptosporidium in Drinking Water Using Filtration/IMS/IFA.
- ☆ State of Idaho - Report for the Idaho Department of Agriculture (IDA) and local environmental groups on Chronic Wasting Disease in Elk/Deer and the potential for this prion disease to contaminate soil and water. The report aided IDA in establishing guidelines for commercial deer farms based on risks to the environment and wildlife near the commercial sites.
- ☆ Idaho Department of Health and Welfare - Ongoing trace metal analytical and technical support to laboratory staff.
- ☆ Washington Department of Health - Technical support to laboratory staff to improve mercury analytical techniques.
- ☆ Idaho Bureau of Laboratories - Assistance to laboratory staff in troubleshooting nitrate and nitrite analytical techniques.
- ☆ Idaho Department of Agriculture and Washington State University - Assistance to laboratory staff to improve phosphorous analytical techniques.
- ☆ Oregon Department of Health and City of Moscow, Idaho - Assistance in improving BOD analytical results.
- ☆ Seattle Public Utilities Laboratories - Technical support regarding ICP/MS/DRC capabilities and operation.
- ☆ Edge Analytical Laboratory - Assistance with cyanide analytical techniques.
- ☆ Boise Laboratory - Assistance with nitrate and TKN techniques.
- ☆ Alchem Laboratory and Magic Valley Laboratory - Assistance with BOD analytical techniques.

★ Technical support and peer review to tribes:

- ☆ Douglas Indian Association - Analysis of water and sediment samples for the on-going Taku River Project.
- ☆ Yakama Tribe - Preparing and weighing $PM_{2.5}$ air monitoring filters.
- ☆ Chehalis Tribe - Assistance to laboratory staff to help establish good analytical techniques for a variety of classical chemistry tests.
- ☆ Klamath Tribe - The laboratory was visited by a Manchester scientist to assist laboratory staff in improving classical chemistry analytical techniques.

The Laboratory initiates or is asked to participate in studies that will improve a laboratory analytical or management capability. Special studies conducted at Manchester during 2002 included:

★ The Laboratory initiated and conducted a study on recreational waters in Idaho designed to establish levels of E. coli, enterococci, S. aureus and fecal coliform bacteria in such waters, evaluate and compare various methodologies available for detection of these bacteria, and determine the feasibility of using the mobile microbiology laboratory in this kind of study. Future studies could determine trends in bacterial loading in recreational waters. Another focus of the study was evaluating enterococci strains for the presence of antibiotic resistance. The report is complete and has been provided to Idaho for review.

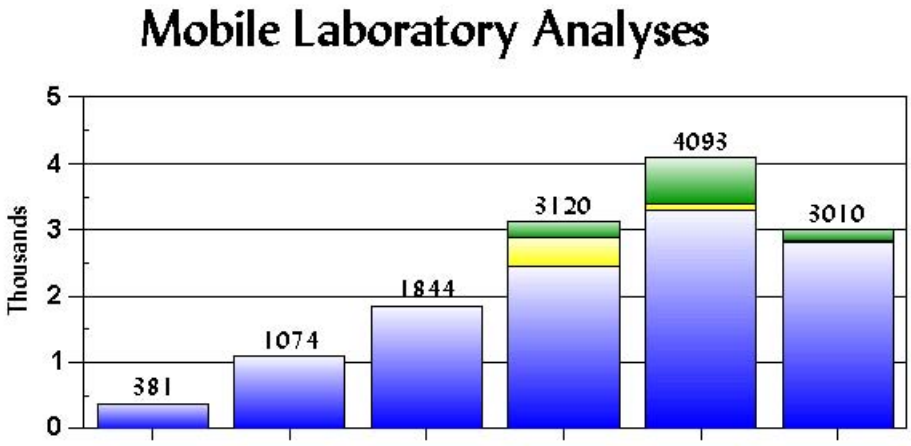
★ A human health risk analysis for pathogens potentially present in fecal material in horses was performed for the Office of General Counsel. The request stems from a current ORC case in discovery involving the risk to human health and the environment from the contamination of surface waters by horse manure. The report confirms that direct/indirect contact with water contaminated by fecal material from horses can pose a public health risk.

★ A stability study of a prototype detector proposed for the Perkin Elmer Elan 6100- ICP/MS/DRC was performed in support of Perkin Elmer's efforts to improve the stability of dual detector calibration for Dynamic Reaction Cell (DRC) instruments. The results of this study will provide useful information to other EPA laboratories in the process of purchasing ICP/MS instruments equipped with DRC.

★ Bench studies were performed to determine the appropriate type and amount of reductant to be used at the Frontier Hard Chrome Superfund site for the treatment of soils contaminated with Cr^{+6}.

★ Agilent Technology's GC/ICP/MS was evaluated for the analysis of organic compounds containing phosphorus, sulfur, chlorine, bromine, and iodine. Element specific information provides valuable tools to assist in detecting and quantifying complex pesticides and herbicides. The instrument can perform compound independent calibrations (CIC) in a manner similar to an AED. Recent GC/ICP/MS data demonstrates increased sensitivity and better chromatography compared to that obtained using GC/AED, while still displaying some degree of CIC capability. Three different reagent gases, He, O_2, and N_2, were tested while varying gas flows and instrument plasma energy. Data obtained in future tests using 100% fluoridated Freon and/or air will be compared to Method 8085 instrument performance criteria with and without matrix backgrounds. Other tests to determine instrument performance for PBDEs, tributyl tins, and nitrogen containing compounds will be made as well. Agilent Corporation's goal is to determine the feasibility of manufacturing an ICP-MS specifically for the GC. Manchester's interest is to determine if this instrument is a viable replacement for the AED.

The benefits of moving laboratory analysis to the field are clear. Quicker turnaround time for sample processing, real-time interaction between the analyst and the field staff for problem resolution and data interpretation, and faster environmental decisions at the site. The graph below shows the number of analyses performed in the field from 1997 to 2002.



	1997	1998	1999	2000	2001	2002
Superfund	381	1074	1844	2469	3311	2816
CAFO				435	92	58
BEACH				216	690	136

SF analyses current as of March 31 of each year

Chemistry - A vibrant field capability has had particular relevance to Superfund cleanups. For several years the Region has possessed a significant field capability staffed by the ESAT contractor and used in support of the Superfund program. Over time, the level of support has grown from simple field tests to an impressive capability including GC parameters PAH, PCP, TPH-D, BTEX, chlorinated volatiles, freons, dinoseb, PCBs, chlorinated pesticides, herbicides, EDB and DBCP; hexavalent chrome; metals by AA and XRF; and general probe type parameters such as pH, DO and turbidity. Sampling capability includes soil, sediment and water for surface samples and subsurface samples by direct push technology (DPT).

DPT refers to a group of tools used for performing subsurface investigations by driving, pushing and/or vibrating small diameter hollow steel rods into the ground with sampling tools used for the collection of soil, ground water, and soil gas samples attached to the rods. A new DPT truck-mounted Geoprobe 6600 system was purchased in 2002. The system has the additional capability to install 2" monitoring wells at a fraction of the cost and time when compared to using standard drill rigs. The

Geoprobe with DPT may be used to support the Hazardous Waste and Superfund programs. This unit was successfully used to install monitoring wells and to collect samples at the Frontier Hard Chrome and Advance Electroplating Superfund sites during FY 2002.

During the 2002 sampling season, 2,800 analyses were performed at six different field sampling/analysis project sites.

Microbiology - A new microbiology field laboratory supported the Superfund program and the Water Program. 209 analyses were performed at 20 different sites in Washington and Idaho with purposes as diverse as proving that recently drilled wells at the Wycoff Superfund site were acceptable for potable use; the testing of recreational waters in Idaho for the Office of Water under the BEACHes Program; and CAFO enforcement support.

Quality Assurance

Producing data of known and documented quality is essential to any credible laboratory operation. At Manchester, we try to go farther and produce excellent data that can withstand the harshest scrutiny. While sample and instrument limitations occasionally prevent universal success, striving to generate the best data possible has always been an ethic fundamental to this laboratory. We hold the premise that improvement is always possible and we are continually seeking to do our jobs better. Quality assurance continues to evolve as we learn more about techniques to ensure a higher quality product. Efforts to improve have been especially evident this past year:

★ A more practical approach for establishing laboratory Reporting Limits (RL) is being developed based upon precision and accuracy criteria at low quantitation levels. This procedure is different from the current approach of establishing method detection limits through precision measurements at low concentrations. The implication is that as the measurement increases above the MDL, confidence in quantitation increases. This implied increase in confidence of quantitation is intuitively acceptable but is not currently supported with experimental data. By including accuracy as well as precision data our approach provides greater confidence in quantitation near the reporting limits.

★ The QA Manual was rewritten to reflect the latest updates and other changes in EPA QA guidance for corrective actions, data qualification, and other QA/QC issues including a "Treatise on the Integration of Chromatographic Peaks." The treatise provides guidance for manual integration of chromatographic responses to Region 10 laboratory chemists.

★ The laboratory maintained certification for the following drinking water parameters:

☆Volatiles by 504.1	☆Semi-volatiles by 505	☆Herbicides by 515.3
☆Carbamates by 531.1	☆Decachlorobiphenyl by 508A	☆Volatiles by 524.2
☆Semivolatiles by 525.2	☆Glyphosate by 547	☆Diquat by 549.2
☆Metals by 200.7	☆Metals by 200.8	☆Metals by 200.9
☆Metals by 245.1	☆Cyanide by 335.4	☆Nitrate/Nitrite by 353.2
☆Perchlorate by 314	☆Total Coliforms	☆Fecal Coliforms
☆E.Coli	☆Heterotrophic Plate Count	

☆Inorganic Disinfection Byproducts by Method 300.1B
☆Interim certification for Haloacetic Acids Method 552.2
☆Provisional Certification for Endothall

★ Manchester Laboratory participated in the following Performance Evaluation Studies for FY 2002:

☆QB1- Organics - 85%	☆QB2- Organics - 78%*	☆QB2- Inorganics - 100%
☆QB4- Organics - 92%	☆WS67 - 94.8%	☆WS-70 - 96.7%
☆WP-88 - 100%	☆PE 1-FY02 - Organics - 95%	

NOTE: Manchester Laboratory recently converted to certified performance testing (PT) samples for sediments but continues to use WS and WP samples to evaluate water matrices. Organic QB performance evaluation (PE) results were self scored by Manchester Laboratory's QA officer.
* Corrective action was taken to address extraction issues uncovered in performance test.

Method Development

The business of environmental analysis is constantly changing. As we learn more about the effects of certain compounds on public health and the environment, lower detection limits are needed. The presence of new chemicals in the environment require new analytical methods to detect and measure them. New methods requiring the use of less sample, solvents and reagents are also being sought in the name of pollution prevention. Manchester was involved in the following method development efforts during the past year:

★ Giardia and Cryptosporidium - Assisted in on-going review and modifications of Method 1623 (Detection of Giardia and Cryptosporidium in Drinking Water Using IMS/IFA).

★ Enterococci - Concerned that enterococci resistant to the antibiotic vancomycin were finding their way into the environment, an environmental test was developed to detect vancomycin resistant strains.

★ Polymerase Chain Reaction - Continued to develop a PCR method for detection of Cyclospora. The team acquired a new instrument which allows "real time" PCR testing, was trained in the use of the instrument and specifically its application to Cyclospora detection. Work is underway to develop a technique to simultaneously filter the sample and purify the Cyclospora DNA from spiked matrix samples containing algae and other interfering biological organisms and debris. This methodology was successful with reagent water samples and is being expanded to environmental samples.

★ Mineralogical Analysis - Evaluation of portable X-ray fluorescence sensitivity for metals in X-ray diffraction (XRD) specimens was continued as part of an effort to incorporate XRF analysis into the Region 10 XRD method. Complementary XRF analysis allows timely screening of samples for those with the most relevant contaminant concentrations, provides an aid in phase identification, and gives an indication of element substitution in non-ideal minerals. Another complementary tool for mineralogical analysis, analytical scanning electron microscopy (SEM) by means of remote operation of an SEM via the internet was demonstrated at the laboratory and is being evaluated for an operational connection to an SEM laboratory at ORD-NERL.

★ Arsenic Speciation - Arsenic toxicity varies with the form of the arsenic being consumed. Some populations in Region 10 may have high exposures to the particularly toxic forms of inorganic arsenic, dimethyl arsenite (DMA) and monomethyl arsenate (MMA), due to high seafood consumption rates. A lack of information on speciated arsenic concentrations in fish, shellfish and seaweed, results in a high level of uncertainty in characterizing the associated risk. Scientists from NERL-Cincinnati and Manchester developed a method to distinguish arsenic species in sea foods. Once validation studies currently in progress are complete, incorporation of the method into various method compendia (SW-846, Office of Water) will be explored.

★ Alcohols in Waste - To provide more flexibility to laboratory operations, an ion chromatography method was developed for the analysis of alcohols in wastes to determine if samples complied with RCRA Hazardous Waste Characteristics.

Laboratory Certification, Capacity Building, Training

An important function of the Laboratory is to share knowledge of laboratory methods and practices. While laboratory certification is a regulatory function, Manchester also uses it as a training venue for developing and improving the capabilities of the laboratory being audited. The success of this philosophy is demonstrated by the success of Region 10 states in achieving certification under the drinking water program. This success is due in no small part to the fact that the Region 10 Laboratory is fully certified for all regulated and unregulated chemistry and microbiology parameters with the exception of chlorinated dioxin, radio nuclides and asbestos. Our commitment to maintaining certification lends credibility to Region 10's program, helps the Region as a technical resource and has QA ramifications that are transferrable to other programs. The Laboratory also assisted Indian environmental programs to gain proficiency in analyzing environmental samples.

★ A comprehensive drinking water certification audit was performed at the Idaho Department of Health and Welfare in Boise, Idaho.

★ Training in Method 1623, (Detection of Giardia and Cryptosporidium in Drinking Water Using IMS/IFA) was provided to analysts from:

- ☆ Idaho Department of Health and Welfare
- ☆ Commercial laboratory in Alaska
- ☆ City of Phoenix Health Laboratory
- ☆ County of Maui Water Supply
- ☆ Washington Public Health Laboratory

★ Assistance was provided to laboratory staff at the Chehalis Tribal Laboratory to help establish good analytical techniques for a variety of classical chemistry tests.

★ The Klamath Tribal Laboratory was visited by a Manchester scientist to assist laboratory staff in improving classical chemistry analytical techniques.

Assistance to Headquarters Programs

Because much of the Agency's technical knowledge of laboratory science is located in the regional laboratories, we are occasionally asked to provide assistance to Headquarters programs to assist in method development, Headquarters-initiated special studies and other technical areas. Assistance to Headquarters programs by regional laboratory scientists included:

★ Providing technical assistance to Office of Water (HQ) and Technical Support Center (Cincinnati) on the design and implementation of a laboratory approval program for Cryptosporidium detection in drinking water. The laboratory approval program will support the Long Term Interim Enhanced Surface Water Treatment Rule (LT - 2). This regulation will affect all surface water systems with greater than 10,000 hookups.

★ Providing technical assistance in drafting and review of the "Implementation Guidance for Ambient Water Quality Criteria for Bacteria." This document, being developed by Office of Water, will aid state and tribal health authorities in properly designing and implementing their recreational water criteria under the BEACHes regulation.

★ Evaluating "40 CFR MDL Procedure Applied to Water Analysis" using EPA Method 200.8. An issue paper titled Evaluation of the 40 CFR MDL Procedure Applied to Water Analysis Using Method 200.8 was prepared and submitted to the Office of Water, Engineering and Analysis Division, Statistical Support Branch. A proposal for establishing laboratory reporting limits based on the Method 200.8 data is now being prepared.

★ Detailed written comments were provided to the Office of Solid Waste, Economics, Methods, and Risk Analysis Division regarding the proposed Method: Inorganic Arsenic Speciation- Modification for Method 7063.

★ Detailed written comments on EPA Method 200.8, Determination of Trace Elements in Waters and Wastes by ICP/MS, Revision 5.4, May 1994, were provided to the EPA LTIG metals group in order to accelerate the revision of the method. Consolidated comments were submitted by LTIG to the Office of Water, Engineering and Analysis Division Statistical Support Branch.

★ Region 10 Laboratory provided all of the PM2.5 filter weighing support to the Western Regions Fine Particulate Monitoring Program.

★ Manchester scientists reviewed Method 326 "Determination of Inorganic Oxyhalide Disinfection By-Products in Drinking Water using Ion Chromatography Incorporating the Addition of Two Post Column Reagents for Trace Bromate Analysis" for the Technical Support Center of the Office of Ground Water and Drinking Water.

★ Manchester scientists participated in the Office of Solid Waste's Organic Methods Workgroup. The Workgroup reviews methods and supporting documentation for inclusion into SW-846. Manchester scientists contributions helped the Workgroup finalize VOA guidance document Method 5035 and Method 8000C, Determinative Chromatographic Separations, for inclusion in SW-846 later this year. During FY02, a variety of other subjects were considered as well including:
  ☆ micro extraction methods,
  ☆ dioxin analyses, and
  ☆ VOA sampling/preservation techniques.

★ A Manchester scientist participated in the Office of Solid Waste's Inorganic Methods Workgroup review of Method 326 "Determination of Inorganic Oxyhalide Disinfection By-Products in Drinking Water using Ion Chromatography Incorporating the Addition of Two Post Column Reagents for Trace Bromate Analysis" for inclusion in SW846.

The Laboratory is a remote facility. In addition to fielding calls on seemingly every environmental issue imaginable, the staff is asked from time to time to provide assistance to professional and community activities. This year, the Laboratory provided support as follows:

★ Provided laboratory tours and presentations to the following:
- ☆ Regional TMDL Staff,
- ☆ ORD Representatives,
- ☆ Regional Office of Water Staff,
- ☆ National and Regional Budget Office Staff, and
- ☆ Pacific Northwest Pollution Control Association.

★ Several Manchester laboratory scientists helped organize, served as moderators for and made presentations at the 2002 Summer Meeting of the Northwest Chapter of AOAC International, the preeminent professional organization for analytical chemists in the Northwest. Presentations included:
- ☆ Quantitation of Selected Alcohols for RCRA Hazardous Waste Alcohol Exclusion Rule by IC and PAD,
- ☆ Afraid to Drink the Water in Central America? Learn What USEPA is Doing to Help,
- ☆ Use of X-Ray Diffraction (XRD) as a Complement to Metals Analysis for Environmental Assessment,
- ☆ Pesticides Analysis Training in Central America and Lima, Peru, and
- ☆ EPA's Water Protection Program.

★ US EPA Region 10 laboratory staff participated in the Annual Kitsap Water Festival for 4th Graders at Olympic College in Bremerton, Washington.

★ Members of the Manchester laboratory held a formation meeting for local area ion chromatography users.

★ The following technical papers were presented at the EPA 2002 LTIG (Laboratory Technology Information Group) Conference in Athens Georgia:
- ☆ Application of XRD and Analytical SEM in Environmental Assessment.
- ☆ Use of X-ray Diffraction (XRD) as a Complement to Metals Analysis for Environmental Assessment.
- ☆ PCB Congener Separation. The paper described techniques developed at Manchester to separate more toxic coplanar PCBs, minor constituents of Aroclor mixtures, from the prevalent non-coplanar congeners found in Aroclor mixtures in environmental samples. This technique is used to separate, detect, and quantify the more onerous coplanar PCBs employing the relatively inexpensive GC/ECD instead of the higher cost High Resolution GC/MS currently used.

- ☆ Determination of PBDE in Fish. The paper described the use of GC/ECD to detect and quantify PBDEs in environmental samples.
- ☆ Objectives and Accomplishments of the EPA Drinking Water Assistance Program in Central America During a Three-Year Project as Part of the USA Recovery Efforts in Central America After Hurricane Mitch.
- ☆ ICP/MS - Collision/Reaction Cells Technology: A Comparative Look at this Innovative Technique Geared at Writing Purchasing Specifications.

★ Some Laboratory employees had pen pals at High Point Elementary School.

★ Web access to Laboratory work can be found at:
- ☆ Laboratory homepage
  http://yosemite.epa.gov/R10/LAB.NSF/Homepage/Home
- ☆ Laboratory Lab Notes newsletter
  http://yosemite.epa.gov/r10/lab.nsf/webpage/Lab+Notes+The+Newsletter+of+the+USEPA+Region+10+Laboratory
- ☆ Mineralogical reports
  http://yosemite.epa.gov/R10/OEA.NSF/webpage/Mineralogical+Reports

As a full service environmental laboratory, Manchester must comply with the very laws EPA is charged with enforcing. Additionally, the Laboratory is aggressively attempting to take advantage of energy savings technology currently available. Activities that have dominated these efforts over the past year include:

★ The laboratory continues to recycle methylene chloride. Recycling methylene chloride reduces the number of new cases purchased and consumes several gallons of the hazardous waste that would otherwise have to be disposed of by the laboratory. In FY 2002, 20 cases of recycled solvent were used resulting in avoided purchase costs of $2,500 and avoided waste disposal costs of $650.

★ The Beaver Creek remediation project, mitigation for the loss of vernal wetlands consequent to the clean up of the Old Navy Dump Superfund site, was completed. Beaver Creek was returned to its original stream bed after 50 years of being rerouted to provide firefighting water for the adjacent US Navy fuel depot. This mitigation will provide 800 additional feet of forest sheltered habitat suitable for salmon and other anadromous species.

★ Laboratory staff processed and completed three hazardous waste disposal shipments totaling 3,817 pounds at a cost of $13,142.

★ The use of mercury for the removal of elemental sulfur in pesticide samples was eliminated.

★ An aggressive recycling program was initiated which includes glass solvent and acid bottles; clean glass and HDPE plastic sample bottles; glass and plastic beverage bottles; aluminum tins and foil; steel and tin cans; paper; and cardboard.

★ An Environmental Management Systems (EMS) was developed for the Manchester Laboratory. Executive order 13148 requires that every federal agency develop an EMS. Administrator Whitman mandated 12/31/2005 as the date by which all EPA facilities will have implemented an EMS. In FY2002, EPA laboratory staff, in collaboration with the Washington State Department of Ecology laboratory staff, created an EMS implementation team, wrote the laboratory's EMS policy statement, identified the environmental impacts of each aspect of every laboratory activity (335 items), selected the seven most significant laboratory activities that impact the environment, and set targets and objectives for one of the most significant activities ("reduce the solid waste from office activities that goes to a landfill".) Development of an EMS employee training program was initiated and the Laboratory's Recycling Rewards Program was organized.

Health and Safety

The health of Laboratory staff is the most important management imperative. The extensive use of glassware, solvents (some of which are suspected carcinogens), compressed gases and potential exposure to contaminated environmental samples all conspire to make laboratories inherently more risky than office environments. Manchester has invested heavily in its health program and enjoys an excellent safety record. Health and safety highlights from the last year include:

★ Health and safety training was completed in May 2002 which included automated external defibrillator (AED) training. We are currently working on establishing a program to place the AED in service at the Laboratory.

★ Laboratory staff from EPA, ESAT and Washington Department of Ecology participated in a one day disaster preparedness training. Training included earthquake preparedness and response, and laboratory safety.

★ Three Laboratory Safety and Health Committee meetings were held in FY 2002.

★ No accidents, injuries or spills involving EPA personnel occurred during FY 2002.

★ Laboratory Safety and Health Committee members completed the annual safety inspection in July 2002.

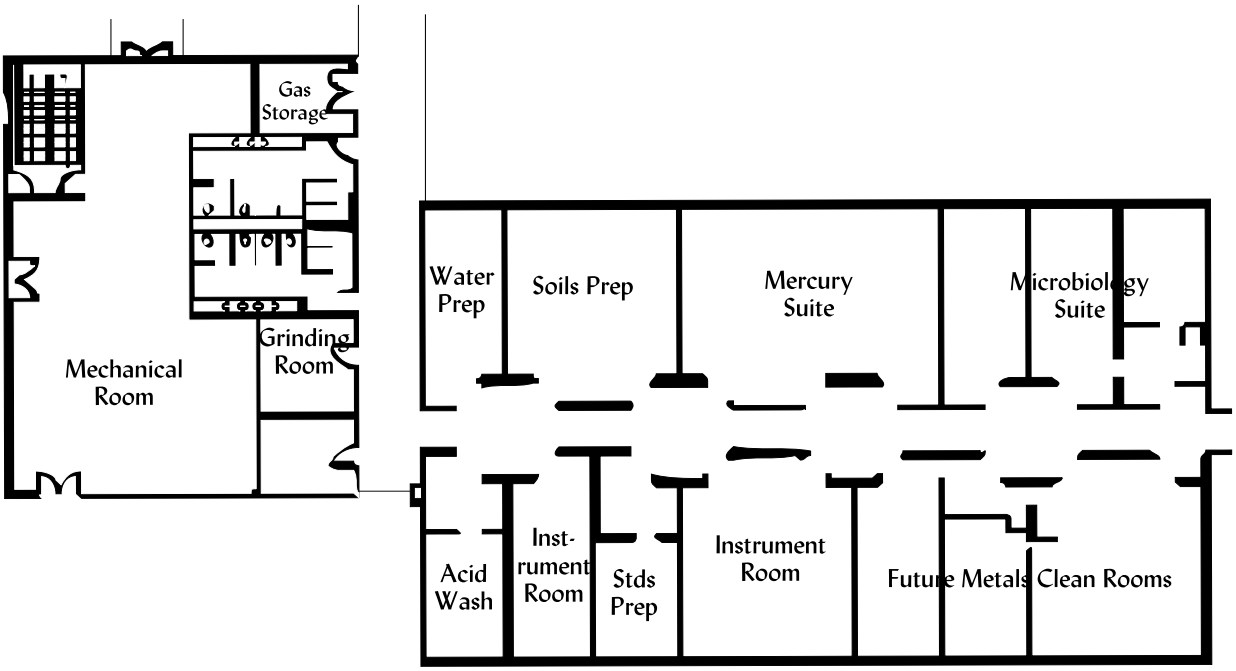
★ Kitsap County Fire Department completed the annual fire safety inspection finding no significant problems.

★ Laboratory staff completed specialized internet safety and health training developed by EPA Headquarters.

The Laboratory is a complex and aging facility housing more people and more functions than it was designed for. Designed as a water testing laboratory to accommodate 40 individuals, the Laboratory has expanded to include several other disciplines and supports a combined EPA, contract and Department of Ecology staff of over 70. Despite its age and overcrowded condition, the Laboratory continues to provide outstanding support to regional and national programs. Two projects dominated the facilities staff in FY 2002:

Laboratory Modernization

Construction continued on a new 7,000 ft^2 metals/microbiology wing and a 3,400 ft^2 mechanical room expansion. As of the end of the fiscal year, the structure was complete, most piping systems had been installed and laboratory casework and fume hoods were in place. The new wing will provide improved facilities for metals analysis and a new microbiology clean room suite for DNA work. The space vacated by metals in the existing chemistry wing will be modified to relieve overcrowding in the organics laboratories. Due to budget limitations, the complexity of laboratory construction and rigorous program demands that require ambitious engineering solutions, the metals clean room suite will not be completed during this construction period. Hopefully, metals clean room design and construction will follow shortly after Phase II is completed. The floor plan for the new wing is shown below:



★ Planning began for the renovation of the existing laboratory (Phase II). Phase II of the Laboratory's modernization program will be completed in multiple stages over the next few years and include modernization of the ventilation systems, mechanical systems and replacement of all fume hoods and case work in the existing wings. When completed, the existing laboratories will be as safe and energy efficient as the new wing.

★ Other facilities projects in FY 2002 of note:

- ☆ Installation of a new state-of-the-art security and fire alarm system began in August 2002 and is scheduled for completion in December 2002.
- ☆ One of the laboratory chillers was repaired at a cost of approximately $10,000 rather than replacing it at a cost of over $100,000. The development of new refrigerant leak detection systems enabled on-site contract employees to troubleshoot the system and determine that it did not require replacement as the manufacturer had been suggesting for the past few years.
- ☆ The exterior of the entire laboratory was painted in August 2002.

The Laboratory exists to generate data. Information systems are critical to the collection, management and presentation of that data. Information systems are also required for communication, administrative processes and management systems. In addition to the regional LAN, the Laboratory uses a Laboratory Information Management System (LIMS) to manage laboratory data. In some cases, work areas in the laboratory have their own system that processes information before transfer to the LIMS. Customized software must frequently be written for virtually all systems at the Laboratory. Information technology highlights include:

★ A new electronic benchsheet program for the metals work area was developed and implemented allowing electronic review and transfer of data from the ICP, ICP/MS and the new IRIS instrument.

★ A new LIMS database was designed and implemented on an Oracle test server. Applications were created that allow transfer of existing LIMS data to this system for further design testing and application development in preparation for the next generation LIMS at Manchester.

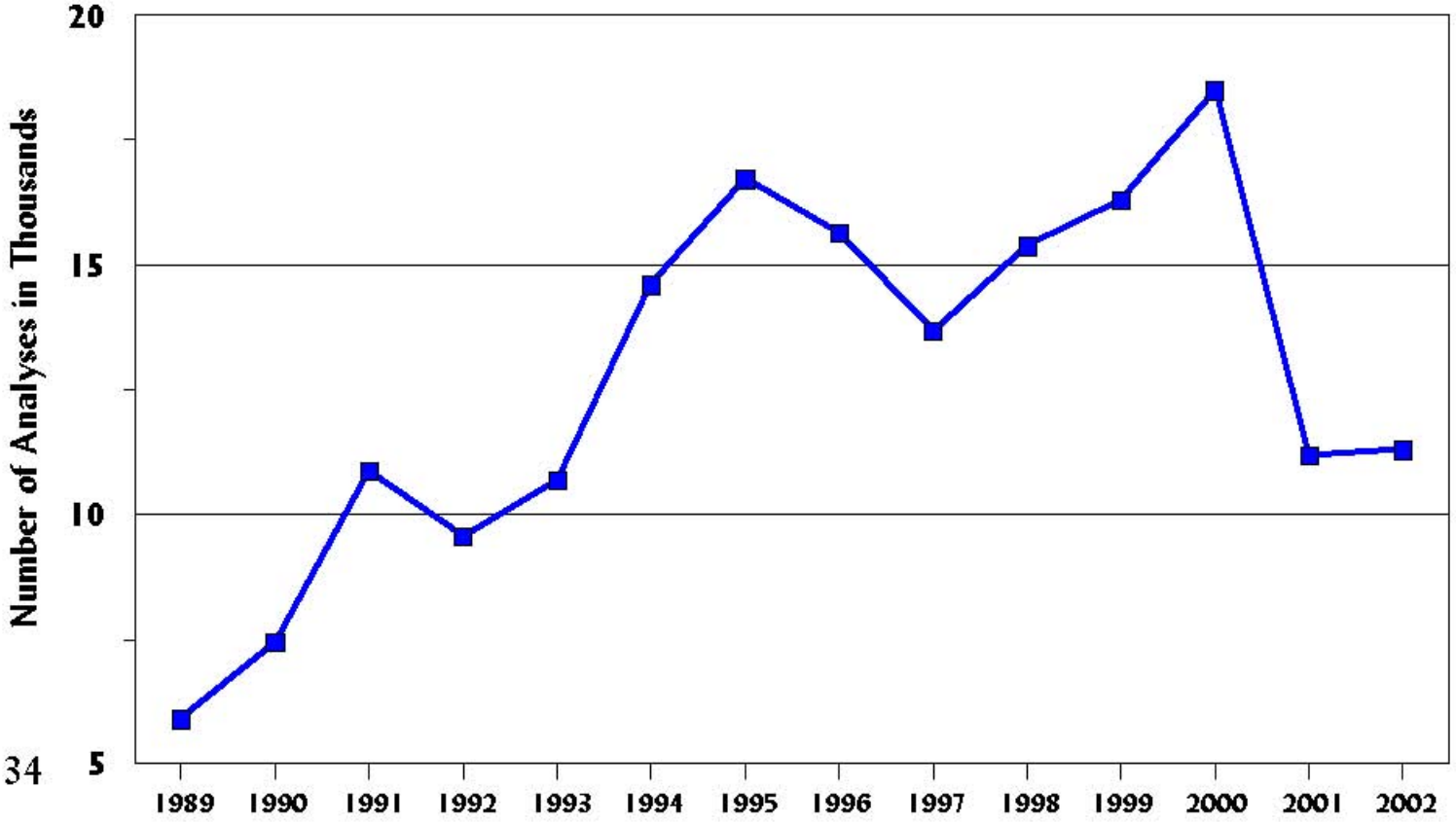
EPA staff is responsible for non-Superfund sample analysis, some limited Superfund analysis, external laboratory activities such as laboratory certification and outreach, and all infrastructure functions supporting the entire Laboratory. The ESAT contract directs a significant analytical capability at a voluminous Superfund sample load. The graphs that follow illustrate how laboratory staffing and analytical throughput have changed over time. While it would seem logical to attempt to correlate sample throughput with staffing levels, such correlation is difficult at best. In the past, for example, ESAT has also performed other functions such as the preparation of performance evaluation samples for the microbiology portion of the Drinking Water Information Collection Rule. This function added 6 FTE to the total laboratory work force but resulted in no sample analyses that would be counted in any tabulation of analytical throughput. Further, analyses are not the same. Some analyses take much longer than others and the graphs of analytical throughput make no attempt to normalize on that basis.

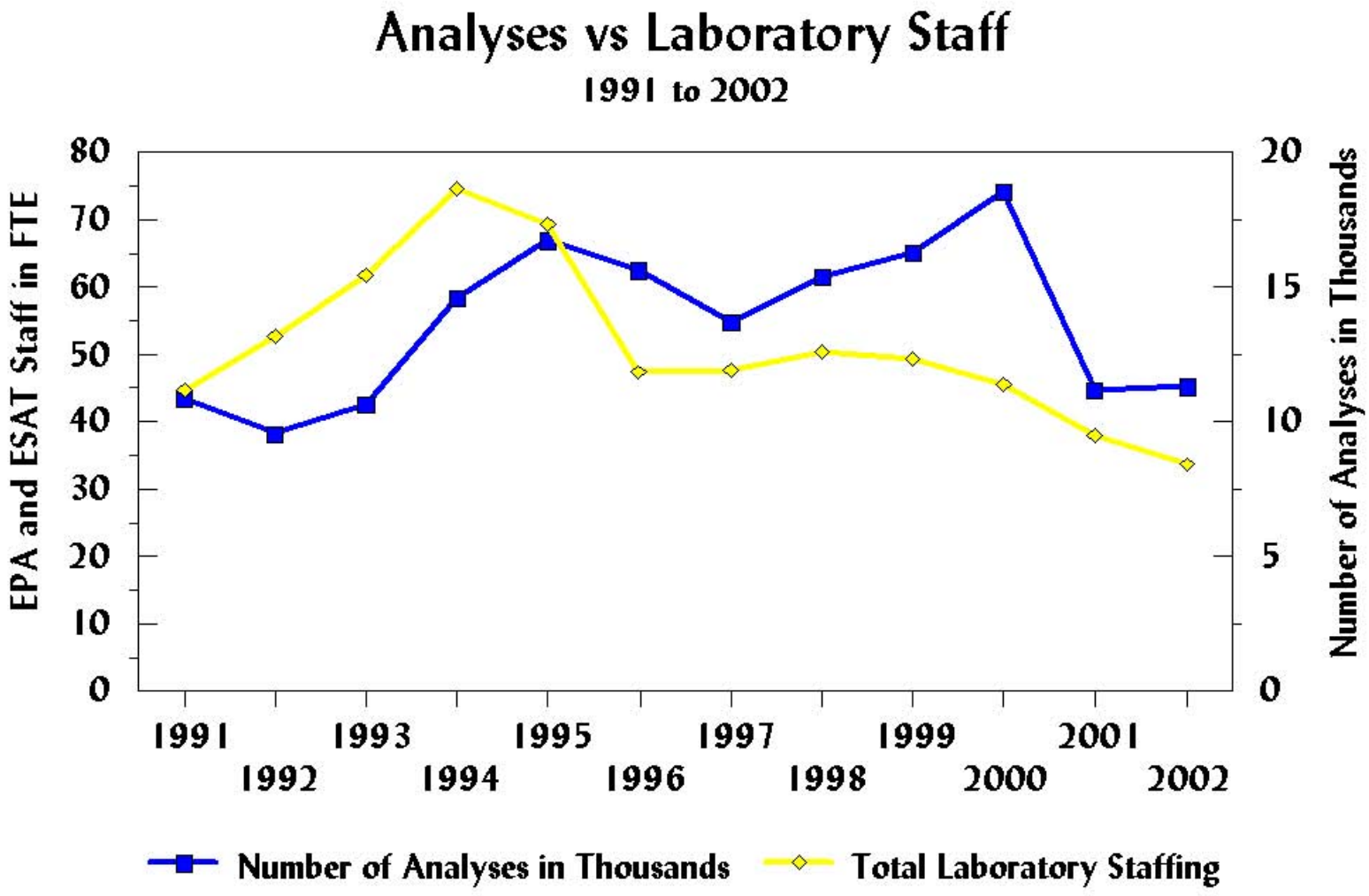
Although correlations between sample throughput and staffing should be made very cautiously, the graph on page 48, Analyses vs Laboratory Staffing, shows that analytical throughput and staffing appeared to correlate fairly well from 1991 to 1995. The divergence between the two plots from 1997 to 2000 suggests that the laboratory is becoming more efficient at processing environmental samples. The drop in 2001 and 2002 is probably largely the result of dramatic reductions in the ESAT contract of April 2001, just before the busy field and analytical season.

The graph on page 38 illuminates an emerging concern. Budget stresses are forcing a reduction in contractor staffing levels at a time when senior scientists are retiring. Agency credibility hinges predominantly on good, objective science. Only with a cadre of knowledgeable, committed scientists can such science be assured. If EPA is to remain relevant, it is essential that the Region and the Agency insure that EPA science staffing levels remain constant, or better, increase.

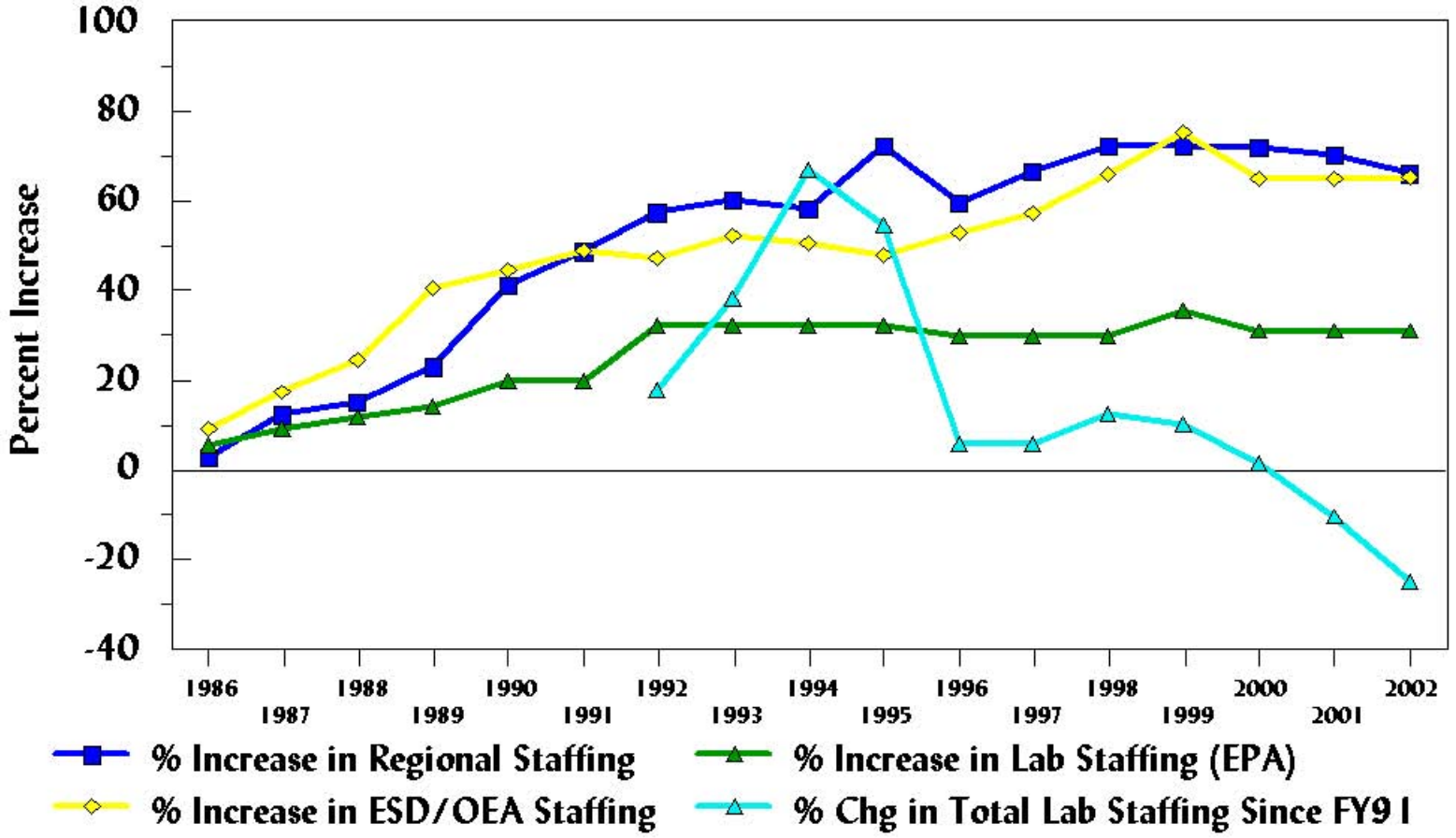
Analytical Throughput

FY 1989 to FY 2002




Analyses vs Laboratory Staff
1991 to 2002
EPA and ESAT Staff in FTE
Number of Analyses in Thousands
80
70
60
50
40
30
20
10
0
20
15
10
5
0
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Number of Analyses in Thousands
Total Laboratory Staffing

Increase in Staffing Since 1985



ESAT Figures before 1991 are

Environmental Chemistry

PCB Congeners - PCB analysis has traditionally been performed as Aroclors, the grouping of PCB congeners by PCB product description. As our understanding of PCB configuration and effect on human physiology has grown, it has become clear that more accurate risk assessments require individual PCB congener determinations. Some PCB congeners, especially those with a chemical configuration similar to dioxin, are of particular concern, demonstrating toxicities approaching dioxin. Several regional laboratories are capable of detecting PCB congeners.

Contacts:

❖Bob Rieck (R10) - (360) 871-8719 (GC/ECD)

X-ray Diffractometry - Knowing the mobility of metal-bearing contaminants in the environment is essential to identifying the public health and environmental risks associated with a contaminated site. The particular compound in which a toxic metal occurs and the compounds which make up the surrounding matrix are critical factors in assessing metal mobility. Regional laboratories are adept at identifying element specific contamination in traditional environmental matrices. However, conventional chemical methods provide only part of the information needed for evaluating the interaction of the compound the element is in with the surrounding matrix. Compound identification is an important complement to chemical analysis for evaluating the mobility of metal-bearing contaminants in the environment and bioavailability of the element to organisms. X-ray diffractometry, a method finding widespread use in mineralogy and materials science, allows identification of compounds and thus adds a tool to chemical analysis for characterizing pollutants and evaluating their fate and transport.

Contact:

❖ David Frank (R10) - (360) 871-8708

Trace Metals Analysis - Adverse impacts of human and environmental exposures to trace metals are driving the need to detect these contaminants at ever lower levels. The regional laboratory is participating in several efforts to better detect and quantify trace metals contamination: speciating between different forms of arsenic to determine the hazard of the exposure and the best mitigation techniques, assisting the Office of Science and Technology to determine better procedures for determining Method Detection Limits to better characterize environmental data, and exploring new detection systems, like ICP/MS/DRC, capable of achieving the lower detection limits required.

Contact:

❖ Isa Chamberlain (R10) - (360) 871-8706

Fish Tissue Extraction and Cleanup - Fish and shellfish are widely consumed in the Pacific Northwest. Many indigenous and immigrant cultures consume far more of these foods than the balance of the population and far more than what human risk models suggest. As a consequence, these populations may be receiving excessive exposures to organic and metals contaminants. Regional scientists have developed unified digestion, extraction and analytical

techniques for fish tissue that permit substantially improved detection limits for a much broader array of analytes than previous techniques provided, allowing more accurate determination of population risk and environmental contamination.

Contact:
❖ Joe Blazevich (R10) - (360) 871-8705

Polybrominated Diphenyl Ethers (PBDEs) - PBDE contamination is an emerging concern in the United States. PBDEs found in Bromkal 70-5DE, a common fire retardant in foam pads and children's clothing, are finding their way into the environment including fish species taken from the Columbia River basin. Structurally similar to PCBs, their health effects may also be similar. The Regional laboratory used eleven congeners found both in Columbia River basin fish and Bromkal 70-5DE to determine Florisil elution patterns, GC retention times, and MDLs. Armed with this information the Regional Laboratory developed a method to separate, isolate, concentrate, detect, and quantify PBDE congeners using state-of-the-art instrumentation.

Contact:
❖ Bob Rieck (R10) - (360) 871-8719

Environmental Microbiology

Parasites in Drinking Water - Untreated or under-treated drinking water systems can expose the population served to two particularly onerous intestinal parasites, Giardia and Cryptosporidium. Almost eight years ago, the city of Milwaukie, WI suffered through an outbreak of Cryptosporidium that sickened several hundred thousand people, killing over 50 immuno-compromised individuals. The ability to detect these parasites in source water and determine the effectiveness of drinking water filtration systems is critical to EPA's responsibility to insure the quality of the public's drinking water supply. Two regional laboratories are proficient at Giardia and Cryptosporidium analysis and one CAS project is devoted to finding a more efficient methodology than that currently available.

Contact:
❖Stephanie Harris (R10) - (360)871-8710

Groundwaters Under Direct Influence of Surface Waters: Microscopic Particulate Analysis (MPA), developed at the Region 10 laboratory, is used nationally to assist water utilities and primacy agencies in determination of ground waters under direct influence of surface water microorganism contaminants. Water sources that are designated as being "Under Direct Surface Influence" must either meet stringent requirements to remain unfiltered or install a treatment system to improve the water quality. The Region 10 laboratory is the only EPA laboratory with this capability and has provided states, utilities, tribal governments and military installations with training, inspections, analytical and technical assistance to help with this determination.

Environmental Chemistry

X-ray Diffractometry (Region 10) - Evaluation of portable X-ray fluorescence (XRF) sensitivity for metals in X-ray diffraction (XRD) specimens was continued as part of an effort to incorporate XRF analysis into the Region 10 XRD method. Complementary XRF analysis allows timely screening of samples for those with the most relevant contaminant concentrations, provides an aid in phase identification, and gives an indication of element substitution in non-ideal minerals. As another complementary tool for mineralogical analysis, analytical scanning electron microscopy by means of remote operation of an SEM via the internet was demonstrated using Region 10 air-particulate and mine-waste samples and is being evaluated for an operational connection between Manchester and an SEM laboratory at ORD-NERL.

Contact: David Frank - (360) 871-8708

Hydride Generation (Region 10) - Methodology developed by a Region 10 chemist in Cincinnati was adapted to Regional instrumentation. Required equipment modifications have been made and the membrane has been acquired from NERL, Cincinnati. All components of the system have been assembled and made ready for chemical system optimization. Initially, the intention was to use the method with high dissolved solids matrices such as sewater. However, because of the difficulty of having to manufature the membrane on site, and the promise of new technology, DRC-ICP/MS, it is unlikely that the hydride method will be offered as a routine analysis.

Contact: Isa Chamberlain - (360) 871-8706

Arsenic Speciation (Region 10) - Visits from the ORD scientist working on the project and a software expert from TurboChrom® assisted in completing the transfer of the chromatography steps to Region 10 instrumentation and staff. Region 10 scientists then experimented with kumamoto oysters, manila clams and ribbon kelp. ORD later found that extraction efficiencies for the various arsenic species were sub-optimal across the target range of seafood sample types (fin fish, shellfish and seaweed). ORD has since determined that a manual extraction with tetramethyl ammonium hydroxide generates the best results across all seafood types. Validation of the method using butter clams is underway. Once validated, the method will be published.

Contact: Isa Chamberlain - (360) 871-8706

PCB Congeners (Region 10) - Protocol for analysis of PCB congeners in various matrices using GC/ECD was completed and tested. Twenty-one contaminated marine sediment samples were analyzed for 45 PCB congeners including the toxic coplanars #77, #81, #126 and #169 incorporating Florosil, mercury and sulfuric acid cleanup procedures. The method produced acceptable precision with method detection limits between 3.5 and 6 parts per trillion for the

coplanar congeners. The technique has been peer reviewed and accepted for publication in a professional journal. The protocol has been submitted to the SW-846 organics work group for incorporation into existing methods.

Contact: Bob Rieck - (360) 871-8719

Contaminants from Modern Wood Pulp Bleaching Processes (Region 10) - Changes in pulp mill bleaching processes resulting from regulatory restrictions leave pulp mill effluents largely uncharacterized. This is a new CAS project designed to identify environmental contaminants from modern pulp mill effluent. A review of the literature has been conducted. A GC/MS instrument expected to be more capable of resolving the highly complex mixtures of organic compounds expected from the mill effluent has been brought on-line. Samples for a preliminary scan of organic components from a pulp mill using a chlorine dioxide bleaching sequence are planned for the second quarter of FY2003.

Contact: Peggy Knight - (360) 871-8713

Polybrominated Diphenyl Ethers (PBDEs) (Region 10) - Additional PBDE congeners were added to the method. The technique has been submitted to the SW-846 organics work group for incorporation into existing methods. A technical paper is being prepared for publication in a professional journal.

Contact: Bob Rieck - (360) 871-8719

Environmental Microbiology

Polymerase Chain Reaction Capability for Protozoans (Region 10) - Cyclospora cayantensis oocysts have been acquired for use in development of this technological capability in the regional laboratory. Work has moved away from the use of a surrogate organism; instead Cyclospora cayantensis is being used, as its availability for research is currently better. New equipment has been obtained for use in PCR and will now provide the analysts with "real time" results. Work is underway using a technology which combines filtration with DNA purification and isolation which will dramatically increase the speed and efficiency of the method. The PCR facility in the new wing at the Manchester Laboratory will improve our ability to ensure the purity and accuracy of the results.

Contact: Stephanie Harris, D.V.M. (R10) - (360) 871-8710